January 2013

Particulate Matter and Ozone Management Fact Sheet (2009 - 2011)

What is $PM_{2.5}$?

Particulate matter can be emitted by any combustion source.

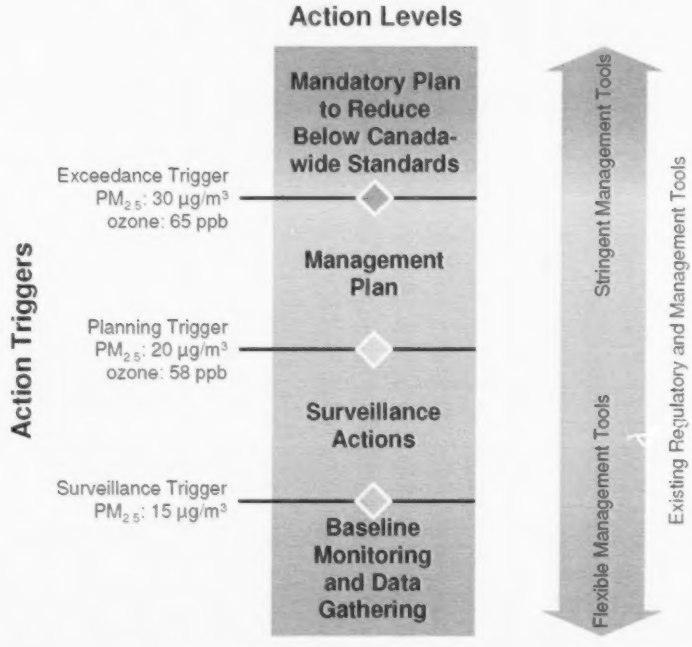
$PM_{2.5}$ is fine particulate matter less than 2.5 micrometres in diameter. In comparison, a human hair is about 70 micrometres in diameter. These fine particles are small enough to penetrate the lungs and can be a human health concern, depending on their composition. $PM_{2.5}$ may form in the atmosphere, or be emitted by any combustion source including automobiles, industrial and wood burning. Smoke from forest fires and other types of biomass burning can also be a major source of $PM_{2.5}$. Standard monitoring methods for $PM_{2.5}$ have recently changed. Equipment installed in the early 2000s has since been found to not measure the full mass of the particulate matter. Newer technology started to be installed in 2009, and better accounts for volatile components that used to be lost.

Ozone is a major component of smog.

What is Ozone?

Ozone in the upper atmosphere protects life on earth by filtering the sun's harmful ultraviolet rays. However, ozone on the ground is a harmful pollutant and a major component of summer time smog. Ozone is produced by a complex series of chemical reactions in the atmosphere. During hot weather conditions, emissions of chemicals from automobiles, industry and other non-natural sources can produce high ozone levels. At times, ozone can be transported down to the surface from the "ozone rich" upper atmosphere, or produced during warm weather conditions due to chemical reactions involving organic compounds emitted by vegetation.

Figure 1 Alberta's Particulate Matter and Ozone Management Framework.
Extracted from CASA Particulate Matter and Ozone Management Framework (September 2003).



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Particulate Matter and Ozone Management

What is the CASA Particulate Matter and Ozone Management Framework?

The *CASA (Clean Air Strategic Alliance) Particulate Matter and Ozone Management Framework* is Alberta's commitment to achieve Canada-wide Standard (CWS) levels by the 2010 target date. Three action triggers and four action levels (described below) were established under the Framework (see Figure 1).

How does the Particulate Matter and Ozone Management Framework work?

- **When ambient particulate matter or ozone concentrations are above the Canada-wide Standard exceedance trigger, there will be a mandatory plan to reduce them.**
  Within two years, Alberta Environment and Sustainable Resource Development (ESRD) will develop a management plan containing measures to reduce ambient concentrations to below the numeric CWS, working with stakeholders where possible.

- **When ambient particulate matter or ozone concentrations are above the planning trigger and below the Canada-wide Standard exceedance trigger, there will be a management plan.**
  A management plan will be developed and implemented by stakeholders with appropriate actions that consider factors such as: (1) trends in population growth and industrial activity, (2) trends in ambient air quality, and (3) ambient concentration relative to the planning trigger. The goal of the management plan level is to prevent a future exceedance of the CWS and to maintain or improve air quality. ESRD may impose a plan if stakeholders do not develop a plan within two years.

- **When ambient particulate matter or ozone concentrations are above the surveillance trigger and below planning trigger, there will be surveillance actions.**
  ESRD, with support from the airshed, takes steps to ensure that sources of elevated concentrations are determined and that trends in ambient concentrations are monitored and analyzed.

- **When ambient particulate matter or ozone concentrations are below the surveillance trigger, there will be baseline monitoring and data gathering.**
  ESRD or airsheds conduct routine monitoring of ambient air quality.

What are the results of the current air quality assessment?

ESRD has completed the assessment of particulate matter and ozone data collected at Alberta monitoring stations from 2009 to 2011. Action levels have been assigned to individual monitoring stations and to the Edmonton and Calgary Census Metropolitan Areas. This was done following the protocols and procedures defined by the CASA Framework and the Canada-wide Standards. The following assessment results include backing out, or removing, episodes that were caused by natural, background, or trans-boundary influences. The results are presented in Figures 2 and 3 and are summarized as follows:

The data from 2009 to 2011 indicate that Alberta did not exceed the Canada-wide Standards for particulate matter and ozone.

Fine Particulate Matter Assessment Results

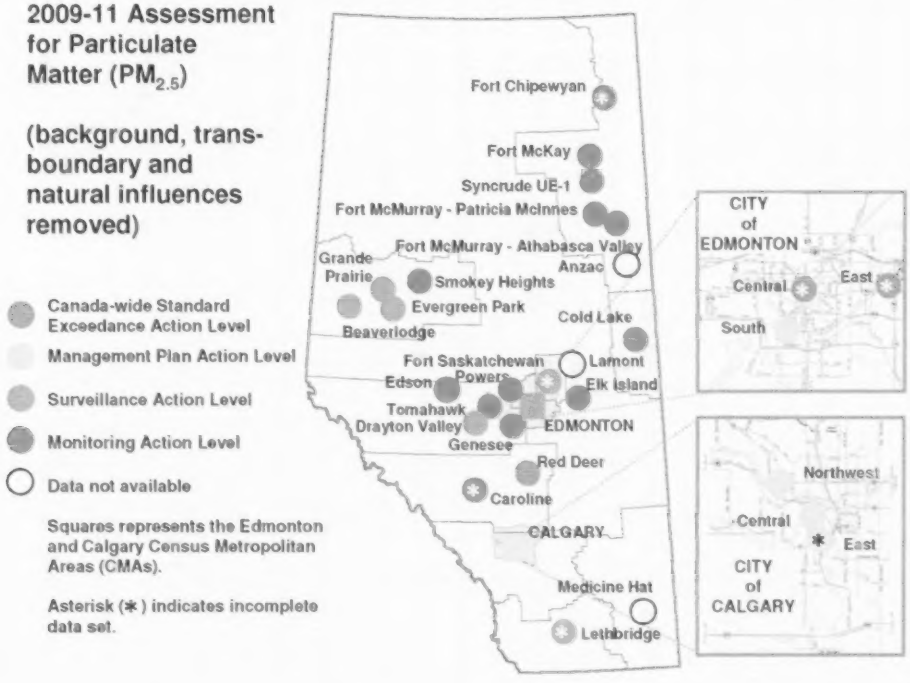
- As they apply to Census Metropolitan Areas, the Canada-wide Standards were not exceeded for particulate matter in Alberta based on data from 2009 to 2011.

- The Red Deer station is above the Exceedance Trigger for $PM_{2.5}$ under the CASA framework, and falls in the Mandatory Plan to Reduce action level. The cause of elevated $PM_{2.5}$ levels in Red Deer was primarily anthropogenic emissions (e.g. automobiles and industry), combined with a higher than normal frequency of stagnant weather conditions (temperature inversions and light winds), in the winters of 2010 and 2011. Also, the change of monitoring technology for $PM_{2.5}$ that occurred in 2009 resulted in higher, but more accurate measurements in 2010 and going forward. When the Exceedance Trigger is exceeded, the action under the CASA Framework is for ESRD to develop a plan to reduce particulate matter concentrations to below the Exceedance Trigger for $PM_{2.5}$, working with stakeholders where possible.

- The Edmonton Central and Edmonton East stations remain in the Mandatory Plan action level, after the 2008-2010 assessment. The Edmonton CMA is represented by an average of all three Edmonton stations, as well as Fort Saskatchewan, Tomahawk, Genesee, and Powers stations; and is in the Surveillance Action level.

- The results of the 2008-2010 assessment showed that the Calgary Census Metropolitan Area as well as all three Calgary stations exceeded the Planning Trigger for $PM_{2.5}$, and they remain in this level following the 2009-2011 assessment. The Edmonton South site also continues to exceed the Planning Trigger. Air quality management plans are already in place for these areas. However, the existing management plans will need to be reviewed and improved to include measures for assuring that future ambient levels of $PM_{2.5}$ do not exceed CWS limits. The Lamont station has insufficient data to report on for 2009-2011, but remains in the Management Plan action level following the 2008-2010 assessment.

Figure 2 Action levels for particulate matter ($PM_{2.5}$) based on 2009 to 2011 data.

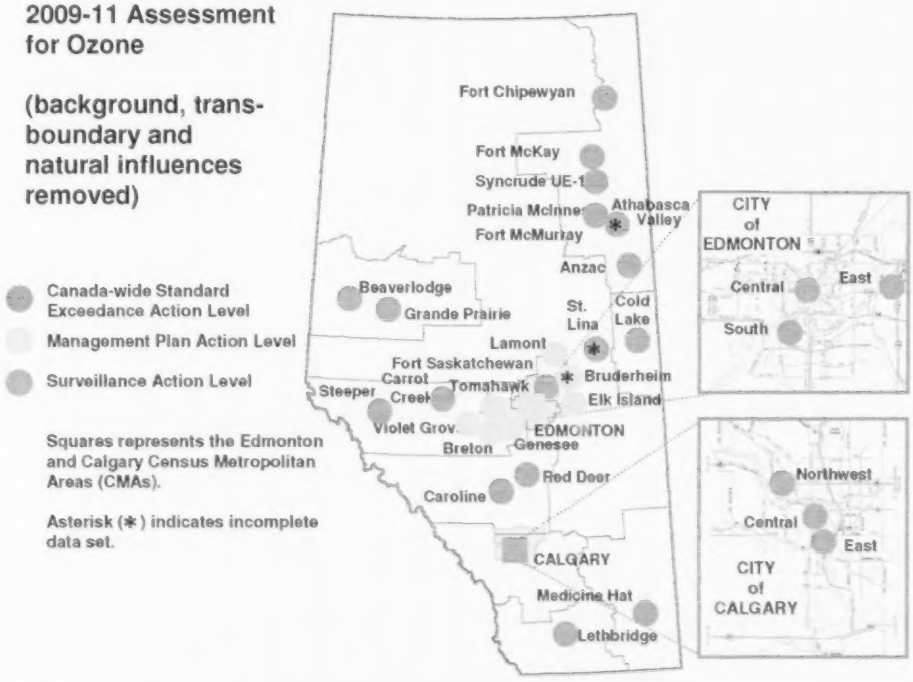


Ozone Assessment Results

- The Edmonton and West Central areas, along with the Fort Saskatchewan, Red Deer and Calgary areas were determined to be at the Management Plan action level for ozone based on the 2001 to 2003 assessment. Stakeholders in these areas have developed air quality management plans and submitted them to ESRD in December of 2008. The goal of the plans was to prevent future exceedances of the CWS trigger, and to date they have been successful in this regard. These plans will be continually reviewed and updated as conditions change in the respective areas.

- The Planning Trigger for ozone was exceeded in the Edmonton Census Metropolitan Area, the West Central airshed, and the Fort Air Partnership airshed after the 2009 to 2011 assessment. It should be noted that portions of these airsheds are located within the boundaries of the Edmonton Census Metropolitan Area. The Elk Island station, which had been in the Surveillance action level, and the new Bruderheim station are now within the Management Plan action level but are already under an ozone management plan. The Edmonton South, Fort Saskatchewan, and Steeper stations are now in the Surveillance action level, but are also still under an ozone management plan.

Figure 3 Action levels for ozone based on 2009 to 2011 data.



Through the CASA Framework, stakeholders develop collaborative management plans to prevent exceedances of the Canada-wide Standard level.

What does this mean?

Ambient air quality levels of particulate matter and ozone are below Canada-wide Standard levels in Census Metropolitan Areas of the province. In keeping with the principles of *keeping clean areas clean*, *pollution prevention* and *continuous improvement*, the Canada-wide

Standard levels are not treated as "pollute up to" levels. For this reason, more stringent action levels have been established through the CASA Framework. These action levels apply to individual stations and allow stakeholders to develop management plans containing preventive measures aimed at avoiding future exceedances of Canada-wide Standard levels.

The management plans are developed through a collaborative process rather than being imposed on stakeholders through a regulatory framework. The plans themselves, however, may be implemented through a wide variety of regulatory and non-regulatory mechanisms.

Management plans may range from compulsory to voluntary actions.

The intent of the CASA Framework is to develop and implement management actions through a process that will facilitate multi-stakeholder responsibility for air quality management. The management plan may range from compulsory actions such as regulations and bylaws to voluntary actions such as providing incentives for use of environmentally responsible modes of transportation. Management actions can be implemented by a variety of organizations including government (federal, provincial or municipal), the private sector and non-government environmental associations.

What are the Canada-wide Standards?

The Canada-wide Standards strike a balance between achieving the best environmental protection possible and the cost of reducing emissions.

The Canadian Council of Ministers of the Environment established Canada-wide Standards for $PM_{2.5}$ and ozone in June 2000. These standards are based on the principles of *continuous improvement*, *pollution prevention* and *keeping-clean-areas-clean*.

The Canada-wide Standards are an important step towards the long-term goal of minimizing the risks of particulate matter and ozone on human health and the environment. They represent a balance between achieving the best health and environmental protection possible and the feasibility and costs of reducing the pollutant emissions that contribute to particulate matter and ground-level ozone in ambient air.

Each province produces comprehensive reports on the standards every five years, beginning in 2006. Annual reports on achievement and maintenance of the standards began in 2011. Provincial implementation plans will outline more comprehensive actions to achieve the standards. The *CASA (Clean Air Strategic Alliance) Particulate and Ozone Management Framework* is Alberta's jurisdictional implementation plan.

The Canada-wide Standards are based on the following calculation metrics:

$PM_{2.5}$	*30 µg/m^3 (micrograms per cubic metre), 24-hour averaging time, by year 2010. Achievement to be based on the 98th percentile ambient measurement annually, averaged over 3 consecutive years.*
Ozone	*65 ppb (parts per billion), 8-hour averaging time, by year 2010. Achievement to be based on the 4th highest daily maximum measurement annually, averaged over 3 consecutive years.*

More information on Particulate Matter and Ozone Management is available online at www.environment.alberta.ca/0895.html